REMARKS

Applicants respectfully traverse and request reconsideration.

Allowable Subject Matter

Claims 1-21 are pending. Claims 1–3, 7–12, 16 and 17 are currently rejected. Claims 20 and 21 are new. The Applicants wish to thank the Examiner for the allowance of claims 18 and 19 and for the notice that claims 4–6 and 13–15 would be allowable if rewritten in independent form, including all of the limitations of the base claim and any intervening claims. For the reasons discussed below, the Applicants respectfully request the rejection to the remaining claims be withdrawn. Support for new claims 20 and 21 may be found in the specification at least on pages 2, 3, 8, and 9.

Chang et al.

Chang et al. is directed to a computer graphics boundary-defined area clipping and extraneous edge deletion method. (Chang, Title.) Chang, as cited, states that X-axis, Y-axis, and Z-axis clipped extraneous edges are each processed for removal differently. (Col. 9, lines 60–62.) "In particular, X-axis and Y-axis extraneous edges are beneficially removed *during the boundary definition stage of system area fill*, while Z-axis extraneous edges are eliminated by processing inserted between the *systems clipping* and area fill stages." (Col. 9, lines 62–66, emphasis added.) Accordingly, as the boundaries are defined, Chang teaches filling the interior of the area defined by the X and Y axis boundaries before clipping along the Z-axis.

Since Chang explicitly requires that the X-axis and Y-axis portion of the primitive is filled as explicitly stated in Chang par. 9, lines 60-68, and since Chang explicitly requires that the Z-axis portion of the primitive is subsequently clipped in column 17, lines 30-34, Chang requires that the entire X-Y plane at any point along the Z-axis, must be first filled, and then Z-axis extraneous edges are subsequently clipped after the X-axis and Y-axis extraneous edges are removed. Consequently, Chang explicitly teaches filling a portion of the primitive in the X-Y plane along the Z-axis that might be outside of the screen region and filling all portions of the boundary defined area in the Z-plane before clipping and, therefore, Chang fails to teach "filling only pixels in the portion of the primitive that is inside the screen region." Z-axis extraneous edges must, therefore, be separately processed subsequent to clipping, but before the area fill stage to remove any unwanted line segments. (Col. 17, lines 31–34.)

Chang, in particular, teaches that the area fill hardware performs a two-mode operation: (1) boundary plot mode; and (2) scan mode. (Col. 10, lines 50–60.) In the boundary plot mode, the closed boundary of the area is drawn and, in the scan mode, the interior of the area is filled. (Col. 10, lines 50–54). Therefore, Chang explicitly teaches (1) first entering the boundary plot mode to draw the closed boundary of the area, and then (2) the scan mode where the interior of the area is filled. Since Chang refers to the area, Chang explicitly requires that the entire interior area of the closed boundary be filled during the boundary plot mode.

The *fill* control plane contains one pixel per scan line per vector, with the result that there are pairs of pixels (i.e., edge flags) per horizontal scan line for a given line segment boundary-defined area. (Col. 10, line 68, Col. 11, line 2, emphasis added.) In the boundary plot mode of Chang, as cited, the *area fill operation* draws the edges of a clipped boundary-defined area to the bit planes, as well as to the screen refresh memory (SRM). (Col. 11, lines 3–6, emphasis added.) Additionally, Chang is limited to horizontal line scanning during the area fill stage. (Col. 11, lines 10–11.) Accordingly, Chang teaches performing the area fill stage operation when the boundary definition command is encountered and then, during the boundary plot mode of the invention, the area fill operation draws the edges of a clipped boundary-defined area to the bit planes. (Col. 11, lines 3–5.) Therefore, in order to commence the area fill stage, when the boundary definition command is encountered, Chang describes filling the interior of the boundary-defined area and then drawing the edges of the clipped boundary-defined area. As a result, Chang teaches filling the entire area of the boundary-defined area before clipping.

Nicholl et al.

Nicholl discloses polygon and polyline clipping for computer graphic displays. For a given polygon ($v_0, v_1, \ldots v_{n-1}$) [vertices of a polygon], and a point P=(xy) that is not on the boundary of the polygon or the window, Nicholl sums the angle of v_0Pv_1, the angle of $v_1Pv_2, \ldots$, the angle of $v_{n-2}Pv_{n-1}$ in radians. (Col. 2, lines 35–38.) Dividing the sum by 2π yields a whole number, the wrap number of the point P. (Col. 2, lines 38–39.) The clockwise direction is the positive direction, just like in mathematics. *Id.* A point on the boundary of the window or the polygon has no wrap number. All points in the window, but not the window boundary that have wrap numbers with respect to the original polygon should also have wrap numbers with respect to the resultant polygon. The wrap numbers of these points with respect to the resultant polygon, should be identical to the wrap numbers they have with respect to the original polygon. This criterion prevents the modification of the topology of

the part of the polygon that is in the window, so that the filling process that might be used after the polygon clipping process can be done correctly. (Col. 2, lines 59–62.)

Rejection of Claims under 35 U.S.C. § 102(b), based on Chang

Claims 1–3, 7–12 and 16–17 are rejected under 35 U.S.C. § 102(b), based on Chang et al. (U.S. Patent No. 5,040,130) ("Chang"). A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference.[1] Furthermore, the identical invention must be shown in as complete detail as contained in the claim.[2] The elements must be arranged as required by the claim.[3]

According to the Advisory Action dated May 17, 2004:

> "Chang et al. clearly discloses that Z-axis extraneous edges must, therefore, be separately processed subsequent clipping but before the area filled stage to remove any unwanted line segments." (Col. 17, [lines] 31-35, FIG. 10a, FIG. 10b) as Z-axis plane also [describes] filling inside the screen/window regions in 3-dimensional clipping process (See FIG. 10a), just like X, Y, in 2-dimensional clipping process. Although, Applicants mention "the X, Y-axis extraneous edges" of Chang et al. reference rather than "Z-axis extraneous edges" it is noted that the features upon which Applicant relies are not recited in the rejected claims.

The very language for which the Advisory Action cites to in Chang at Col. 17, lines 31-35, which states "Z-axis extraneous edges must, therefore, be separately processed subsequent clipping, but before the area fill stage to remove any unwanted line segments" is limited to processing extraneous edges along the Z-axis, rather than the extraneous edges along the X-axis and Y-axis. The Advisory Action appears to completely ignore the portion of Chang that teaches "pursuant to the invention, X-axis, Y-axis, and Z-axis clipped extraneous edges are each processed for removal *differently*." (Chang Col. 9, lines 60-62.) Further, Chang explicitly requires "in particular, X-axis and Y-axis extraneous edges are beneficially removed during the boundary definition stage of the system area fill, while Z-axis extraneous edges are eliminated by processing inserted between the systems clipping and area fill stages." (Chang, Col. 9, lines 63-66.) The Applicants would again like to point

---

[1] *Glaverzel Société Anonyme v. Northlake Marketing & Supply, Inc.*, 75 F.3d 1550, 1554 (Fed. Cir. 1999); *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1953 (Fed. Cir. 1987).

[2] *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989).

[3] *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990).

out the distinction between processing the X- and Y-axis extraneous edges during the boundary definition stage and the Z-axis extraneous edges, which are eliminated only after the systems clipping stage. As such, Chang explicitly requires that clipping occurs only after filling and the X- and Y-axis extraneous edges are removed as a result of the boundary definition stage of the system area fill. As such, the entire area defined by the boundary definition stage is filled and not clipped until the systems clipping stage when Z-axis extraneous edges are eliminated. (Chang, Col. 9, lines 60-67.) Since Chang explicitly teaches filling the entire area defined by the boundary definition stage when X-axis and Y-axis extraneous edges are beneficially removed, before the systems clipping and area fill stages when Z-axis extraneous edges are eliminated, in contrast to the claims Chang explicitly requires filling the entire area defined by the boundary definition stage before clipping. (Chang, Col. 9, lines 60-68.) As such, the reference in the advisory action to only the Z-axis plane processing, as cited in Col. 17, lines 31-35, is incomplete with respect to processing of the X-Y plane, as further described in Chang at Col. 9, lines 60-68.) As such, the Advisory Action mischaracterizes Chang by implying "as Z-axis plane also [describes] filling inside the screen/window regions in 3-dimensional clipping process (See FIG. 10a), just like X, Y-axis plane in 2-dimensional clipping process." Again, Chang explicitly teaches filling and that X- and Y-axis extraneous edge are removed during the boundary definition stage of system area fill, while Z-axis extraneous edges are eliminated by processing inserted between the systems clipping and area fill stages and therefore, fails to teach "filling only pixels in the portion of the primitive that is inside the screen region". As such, the Office Action fails to show how Chang teaches each and every element as arranged in the claims, mainly "filling only pixels in the portion of the primitive that is inside the screen region."

Therefore, Applicants submit that the Chang language cited by the Office Action regarding claim 1, which states that "in particular, X-axis and Y-axis extraneous edges are beneficially removed during the boundary definition stage of the system area fill, while Z-axis extraneous edges are eliminated by processing inserted between the system's clipping and area fill stages" (Col. 9, lines 62–67), is limited to filling in the boundary-defined area as previously described during the boundary definition stage and then removing the extraneous edges in the X, Y plane (but not the Z plane), rather than Applicants' claimed subject matter including "filling only pixels in the portion of the primitive that is inside the screen region."

As previously stated, Chang teaches filling in the area defined by the boundary definition stage while creating the boundaries. Further, Chang defines the line segment boundary-defined area as any geometric configuration having a closed boundary defined by

means of vertices and connecting straight line segments, e.g., convex, concave and self-intersecting polygons. (Col. 1, lines 22-26.) As a result Chang describes filling and clipping the line segment boundary-defined area rather than a primitive. Therefore, filling and clipping described in Chang, as cited, is limited to processing the line-segment boundary-defined area rather than a primitive, as claimed. Accordingly, Chang describes filling in portions of the primitive that are both inside and outside the screen region, as previously discussed. Thus, the cited portion of Chang, at column 9, line 60 through column 10, line 18, does not describe "filling only pixels in the portion of the primitive that is inside the screen region."

Similarly, the Office Action cites claim 12 of Chang. However, claim 12 similarly describes the clipping plane comprising a Z-axis plane and, as such, does not describe filling the window within the X, Y plane rather than "a primitive," since claim 12 is limited to clipping in the Z-axis plane.

The Chang language cited at col. 10, lines 1–19 by the Final Office Action states:

> In the optimal implementation, the clipped poly lines outputted by the algorithm of FIGS. 6A and 6B are used to generate information which is stored into "working" bit planes (described below) during the boundary definition phase of the system drawing stage. This stored information is then used by the area fill processor during the fill phase to generate the filled area and edges in the display bit planes of pixel memory 30 from which the display is refreshed. As explained below, the boundary definition phase concurrently generates and stores information in the two working bit planes 31 (FIG. 2) as X-axis and Y-axis edges are received by area fill processor 29 from the output of the clipping algorithm. *As described below, Z-axis edges are handled subsequent to processing of said X-axis and Y-axis edges.* The filling phase of the pixel generation stage commences when the above-discussed end boundary definition command is encountered.

(Col. 10, lines 1–19, emphasis added.)

As previously described and as acknowledged in the Final Office Action, since Z-axis edges are handled subsequent to processing and filling of X-axis and Y-axis edges, Chang can not teach "filling only pixels in the portion of the primitive that is inside the screen region." Further, the above-cited portion of Chang is limited to commencing the filling phase when the "boundary definition command is encountered," and then clipping during Z-axis edge removal, rather than "filling only pixels in the portion of the primitive that is inside the screen region." (Col. 10, lines 17–19.) The Applicants would like to point out the distinction between "filling only pixels in the portion of the primitive that is inside the screen region." For example, Chang requires that the filling phase in the X- Y- axis commences when merely

the end boundary definition command is encountered, rather than the actual execution of any boundary definition function occurring, and as such, Chang teaches beginning to fill the entire boundary-defined area in the X-Y plane before encountering the end boundary definition command and therefore before actually discarding any filled portions of the primitive, either inside or outside any screen region during the Z-axis plane stage. As such, Chang teaches that the filling phase must begin during the X- Y-axis processing but before the clipping stage (Z-axis processing) occurs, because the Z-axis edges are handled subsequent to processing of said X-axis and Y-axis edges, and because the filling phase commences when the end boundary definition command is encountered. As a result, the Advisory Action continues to ignore a principal limitation of the claims including "filling only pixels in the portion of the primitive that is inside the screen region." Additionally, since the filling phase commences when the end boundary definition is encountered, the boundary definition stage is not completed before the filling phase, and as such, the only practical way that the filling phase may fill the primitive, before the boundary definition stage is completed is to fill the entire primitive both inside and outside of the screen region.

Applicants submit that the Chang language cited by the final Office Action on page 6 regarding claim 1, which states that "Z-axis extraneous edges must, therefore, be separately processed subsequent clipping but before the area fill stage to remove any unwanted line segments" (Col. 17, lines 31–33), is limited to processing Z-axis extraneous edges subsequent to processing X-axis and Y-axis edges (Col. 10, lines 1-19), rather than Applicants' claimed subject matter, including "filling only pixels in the portion of the primitive that is inside the screen region." The Applicants would again like to point out that the cited portion is limited to Z-axis extraneous edges, as discussed in col. 17, lines 31-35, rather than the Y-axis and X-axis extraneous edges, as discussed in col. 9, lines 62-66. The Applicants would further like to point out the distinction between filling the X-axis and the Y-axis extraneous edges, as discussed in col. 9 and col. 10, lines 1-19, and clipping the Z-axis extraneous edges, as taught in col. 17 and as taught as separate and distinct processes. Therefore, the cited portion of Chang distinctly describes separately processing the Z-axis extraneous edges and therefore, since, as previously stated, Chang describes removing the X-axis and Y-axis extraneous edges after the system area of fill, Chang fails to describe "filling *only* pixels in the portion of the primitive that is inside the screen region." (Emphasis added.) Since Chang describes teaching clipping the Z-axis after X-axis and Y-axis extraneous edges are removed, any discussion in Chang regarding Z-axis extraneous edge removal after the area fill stage still will result in the filling of the primitive outside of the screen region before the Z-axis

extraneous edge is removed. As a result, the Office Action ignores a principal limitation in the claims, namely, "filling only pixels in the portion of the primitive that is inside the screen region." As such, Applicants submit that the Chang language, as cited, neither discloses, teaches nor suggests Applicants' claimed subject matter.

As stated in the previous response, Applicants submit that the Chang language cited by the Office Action (including claim 12 at col. 23, lines 55–60 and claim 17 at col. 24, lines 38–43), which states "the boundary-defined area clipping and deletion method of claim 13 further comprising a sorting step prior to said processing step (H) for sorting said point pairs before the area filling process of the computer display system to eliminate any extraneous edge when the clipping plane comprises a Z-axis plane," is limited to a sorting step for filling the boundary-defined area in the X and Y plane, and then clipping when the clipping plane comprises a Z-axis plane, rather than "filling only pixels in the portion of the primitive that is inside the screen region." Therefore, claim 17 and Chang describe filling in the boundary-defined area, including the area both inside and outside the window, according to the sorting step, when the clipping plane comprises a Z-axis plane, and, as such, fails to describe "filling only pixels in the portion of the primitive that is inside the screen region." Applicants submit that the Office Action mischaracterizes Chang in a way to change Chang to read on the claims.

The Office Action on page 2 also cites to FIGS. 3, 7 and 10–12. However, the specification describes reference numeral 40 of FIG. 3A as "pursuing a specific line segment boundary-defined area clipping example, shown in FIG. 3A as a closed surface 40 of irregular shape, a portion of which is depicted to reside within a window or viewport 42." (Col. 5, lines 27–30.) Therefore, since Chang defines the line segment boundary-defined area as the closed surface 40, as shown in FIG. 3A, then Chang refers to the line segment boundary-defined area as the portions that reside both within the window and also without the window. As a result of defining the line segment boundary-defined area as including the area both inside and outside the window, the discussion of filling the area defined by the line segment boundary-defined area therefore requires filling both the areas defined within the window and outside of the window. Furthermore, the reference symbol 40 shown in FIG. 3A is clearly shown to refer to the portion of the line segment boundary-defined area that is outside the window, as described by Chang, also indicating filling both areas inside and outside the window.

The Final Office Action cites to FIGS. 7A on page 2, wherein X-axis extraneous edge detection is depicted. Boundary-defined area 150 is clipped against the Xmin limiting plane

of a clipping window 152, such that two discrete areas 151, shown shaded, remain viewable. (Col. 13, lines 33–38.) Therefore, the boundary-defined areas 150 include both areas within the window and without the window and, as a result, since the area fill stage occurs during the boundary definition stage, Chang teaches filling the entire boundary-defined area both inside the window and outside the window. The shaded portions of the boundary-defined area 151 shown in FIG. 7A and the shaded portion of the boundary-defined area shown in FIG. 3A clearly refer to the portion of the boundary-defined area within the window. Nowhere can the Applicants find where Chang, as cited, describes the shaded portions otherwise. As a result, Chang teaches filling the entire boundary-defined area rather than "the portion of the primitive that is inside the screen region." Nowhere has the Office Action demonstrated that any of the cited figures are shown to describe how Chang teaches "filling only pixels in the portion of the primitive that is inside the screen region." The Office Action merely mischaracterizes Chang in an effort to alter Chang in a way such that Chang would read on the claims. Further, Applicants submit that nowhere in the Office Action on page 3 does the Examiner specifically point out what component of FIGS. 3, 7 or 10 through 12 is performing the function of "filling only pixels in the portion of the primitive that is inside the screen region." Because Applicants can find no language or any description in the figures in Chang that makes reference to "filling only pixels in the portion of the primitive that is inside the screen region," Applicants submit that Chang does not disclose, teach or suggest Applicants' claimed subject matter.

The Final Office Action asserts that the abstract of Chang also describes "filling only pixels in the portion of the primitive that is inside the screen region." Applicants submit that nowhere in the Final Office Action does the Examiner specifically point out where the abstract describes "filling only pixels in the portion of the primitive that is inside the screen region." Because the Applicants are unable to identify language in the abstract of Chang that describes "filling only pixels in the portion of the primitive that is inside the screen region," Applicants submit that Chang does not disclose, teach or suggest Applicants' claimed subject matter. As such, it is respectfully submitted that claims 1–3, 7–12 and 16–17 are allowable as written.

Applicants submit that the Chang language cited by the Final Office Action, which states "wherein said point pair processing occurs during the area fill processing of the graphics display system when said plane comprises an X-axis or Y-axis plane," is limited to describing point pair processing occurring during the area fill processing, rather than fill only pixels in the portion of the primitive that is inside the screen region. Chang neither discloses,

teaches nor suggests Applicants' claimed subject matter. Further, to the extent that Applicants fill only pixels in the portion of the primitive that is inside the screen region, Applicants' claimed subject matter is wholly different than that described in Chang, where Chang describes area fill processing while defining all edges in the boundary-defined area. (Col. 3, lines 14–27.)

Claims 10–12 and 16–17

Applicants submit that Chang does not disclose, teach or suggest, either explicitly or implicitly, Applicants' claimed subject matter, *inter alia*, "an output for supplying filled pixels for pixels in the portion of the primitive inside of the screen region." Applicants reassert the relevant arguments made above. Applicants further submit, argued in part at least immediately above, that claims 10, 11, 12, 16 and 17 are allowable in light of the presence of novel and non-obvious elements that are contained in these claims that are not otherwise present in claim 1.

Dependent Claims 3, 7 and 8

Applicants reassert the relevant arguments made above regarding claim 1. Applicants submit that claims 3, 7 and 8 are allowable for at least the same reasons discussed above regarding claim 1. In addition, Applicants submit that, because claims 3, 7 and 8 depend from claim 1 and, as dependent claims therefrom, claims 3, 7 and 8 are allowable for the reasons claim 1 is allowable, Applicants further submit that claims 3, 7 and 8 are also allowable in light of the presence of novel and non-obvious elements contained in claims 3, 7 and 8 that are not otherwise present in claim 1. Applicants reassert the relevant arguments made above.

The Office Action asserts that FIG. 1A, FIG. 2, and column 1 line 35 through column 3 line 31 describe "determining values of XSTART, YSTART, XEND, YEND FOR THE PRIMITIVE, XSTART and XEND defining an X where X is capitalized direction extent and location of the primitive in the coordinates system, and YSTART and YEND defining a Y direction extent and location of the primitive in the coordinate system." Applicants submit that nowhere in the Office Action does the Examiner specifically point out what component is performing the claimed invention *inter alia* "determining values of XSTART, ..." Because Applicant cannot find language in Nicholl that makes reference to each and every element of the claimed invention as arranged in the claim and, further, can also not identify *inter alia* language regarding an edge walker such that "edge walking the edge of the primitive from the start point to a boundary of the screen region," Applicants submit that Nicholl does not disclose, teach or suggest Applicants' claimed subject matter.

As such, it is respectfully submitted that claims 3, 7 and 8 are allowable as written. Instead, Nicholl describes an approach that is wholly different from Applicants' claimed subject matter, since Nicholl describes satisfying criteria related to a wrap number such that wrap numbers, as previously described of these points with respect to the result in polygon, should be identical to the wrap numbers they have with respect to the original polygon. (Nicholl, ¶2, lines 56–59.)

New Claims 20 and 21

New claim 20 recites, among other things "edgewalking starting with the start vertex and proceeding to an intersection point with the screen region and the primitive, at which time only the portion of the primitive that is inside the screen region is filled." As stated above, Chang commences the filling phase when the "boundary definition command is encountered." (Chang Col 10 lines 17-19).

As such, Chang fails to recite "edgewalking starting with the start vertex and proceeding to an intersection point with the screen region and the primitive, at which time only the portion of the primitive that is inside the screen region is filled." Applicants reassert the relevant arguments made above. Dependent claim 21 is also allowable in light of the presence of novel and non-obvious elements contained in claim 21 that are not otherwise present in claim 20.

Conclusion

Applicants respectfully submit that the claims are in condition for allowance and respectfully request that a timely Notice of Allowance be issued in this case. The Examiner is invited to contact the below-listed attorney at 312-609-7970 if the Examiner believes that a telephone conference will advance the prosecution of this application.

Respectfully submitted,

By: _____
Themi Anagnos
Registration No. 47,388

Date: May 27, 2004

VEDDER, PRICE, KAUFMAN & KAMMHOLZ, P.C.
222 N. LaSalle Street
Chicago, IL 60601
(312) 609-7500
FAX: (312) 609-5005